Rubber World

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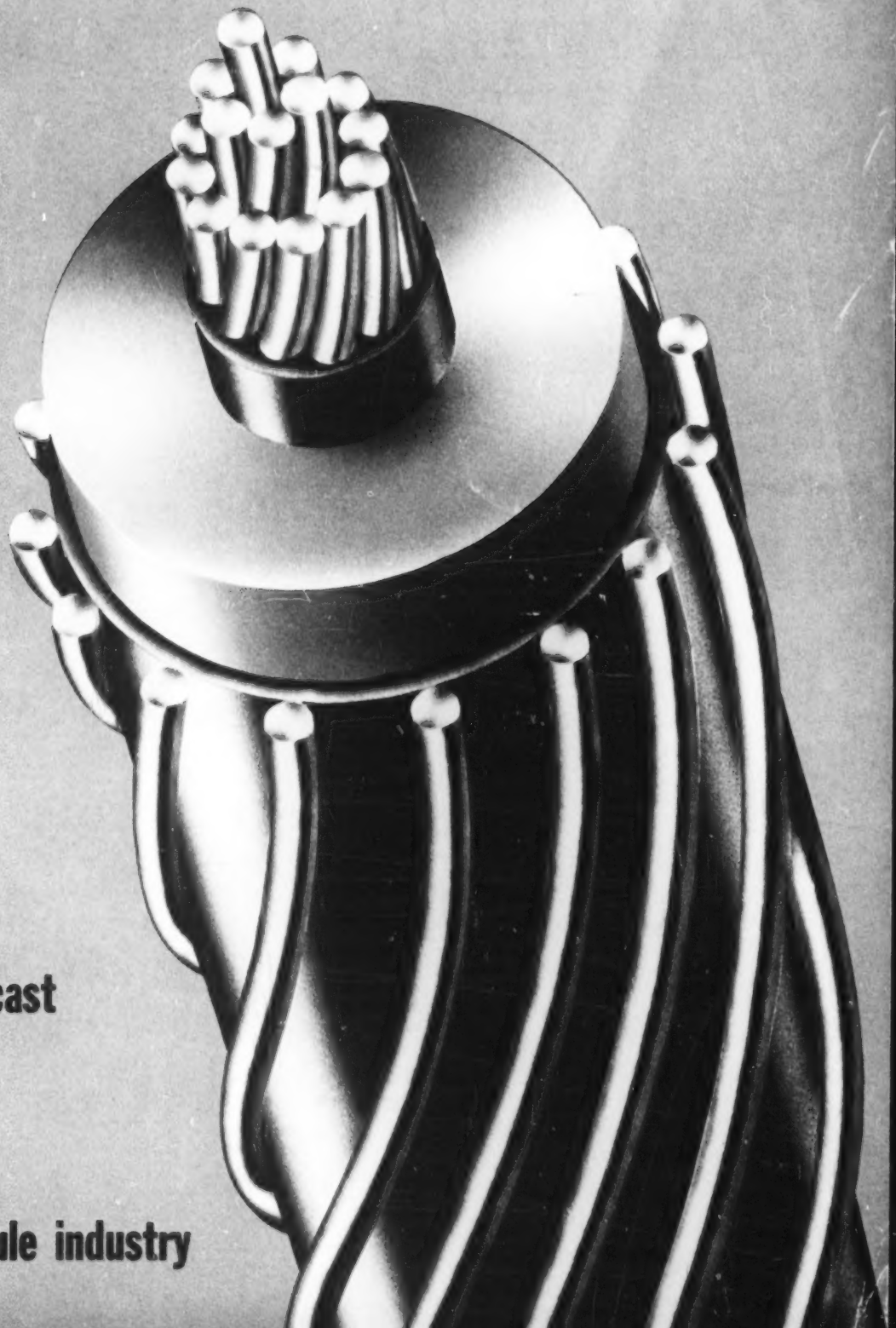


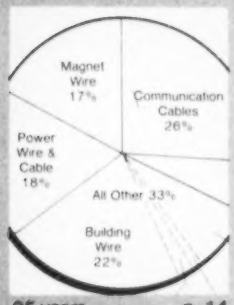
Wire & Cable

Industrial products forecast

Pentagon rescuing guayule industry

Rubber World

VOLUME 187/NUMBER 2/NOVEMBER 1982



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Cover

Artist's rendition of an underground distribution type cable courtesy of the DuPont Co., Wilmington, DE.

ABP

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Business Briefs

Acquisitions, expansions

Polysar Limited reached an agreement with **Columbian Chemicals** to acquire certain assets associated with Columbian's butyl rubber business. Polysar will receive patents, goodwill and access to Columbian's customers. Columbian's Lake Charles, LA, plant with a 76 million pounds annual capacity is not included in the sale. Columbian said it decided not to invest money in modernizing the 20-year-old plant in face of declining demand for the product. Approximately 70 hourly plant employees will be laid off in addition to 40 salaried employees.

Firestone chose Prescott, AR, as the site for its multimillion dollar EPDM roofing plant. The new factory will have more than 250,000 square feet of production space and produce more than 400 million square feet of roofing per year. The plant will utilize portions of an existing Firestone facility that formerly produced hose. Production is expected to begin next year and the plant will employ approximately 200 people.

Kelly-Springfield will spend approximately $5 million on the installation of radial tire building and vulcanizing equipment for its plant in Fayetteville, NC. The expansion will increase plant capacity of radial passenger tires by nearly 5,000 per day and is to be completed by April 1983.

J.M. Huber Corp. acquired **East-Tex Plastics**, Orange, TX, for an undisclosed amount of cash. East Tex is a supplier of reprocessed and customized polyolefin resins.

Lauren Manufacturing, New Philadelphia, OH, purchased the exclusive worldwide rights to manufacture and merchandise a line of fluoroelastomer industrial coatings and adhesives under a series of new patents developed by Donald Close of Stow, OH. The patents describe the incorporation of organofunctional silane modifiers into fluoroelastomeric polymers.

Carlisle Tire has spun off its roofing business into a separate company called Carlisle SynTec Systems. Both companies are now divisions of Carlisle Corporation.

Tobi Engineering moved to a larger plant in Elk Grove Village, IL combining the Elastomeric Bearing Division with the Teflon Bearing Division in more than 15,000 square feet.

AllChem Industries opened new corporate headquarters in Gainesville, FL. AllChem specializes in hexamine, zinc stearate, lead stearate, aluminum stearate, oxalic acid and sulfamic acid.

Goodyear formed a new General Products Development Center to be located in the company's Technical Center in Akron.

Sil-Med Corp. has moved to a new 22,000 square foot headquarters in Taunton, MA.

Arnco opened its Technical Service Center for Re Pneu tire filling in Chattanooga, TN, to supply equipment, parts and repairs for dealers throughout the midwest and southern states.

Essex Chemical formed a wholly-owned subsidiary, Essex Specialty Products, with corporate offices in Clifton, NJ. The subsidiary will be responsible for the manufacture and distribution of chemical specialties for automotive, industrial and related component manufacturing.

Dunlop will construct an industrial pipe manufacturing plant in Lake Wales, FL. The $10 million facility will begin production by the end of January 1983.

Alkar Inc., Kent, OH, is undergoing expansion adding several thousand square feet and machinery to its rubber equipment rebuilding facility.

Dayco's Belt Technical Center in Springfield, MO, is expanding its service to include developmental work on industrial and hydraulic hose products. Several depart-

RMA industry rubber report through July
(figures are expressed in metric tons)

	Cumulative 1982	Cumulative 1981	% Change 82 vs 81
Total New Rubber			
New rubber available	1,480,579	1,709,420	-13.39
Exports	192,570	237,253	-18.83
Consumption	1,295,673	1,506,300	-13.98
Total Natural Rubber			
Imports	375,374	387,606	-3.16
Stock Pile Deliveries		508	-100.00
Re-Exports	8,298	10,685	-22.34
Consumption	352,515	381,872	-7.69
Total Synthetic Rubber			
Production	1,031,002	1,240,118	-16.86
Imports	74,171	81,187	-8.64
Exports	164,272	226,568	-18.67
Consumption	943,158	1,124,428	-16.12
% Total New Rubber	72.79	74.65	
Total SBR			
Production	527,647	638,650	-17.38
Imports	30,263	29,709	1.86
Exports	52,858	68,002	-22.27
Consumption	523,512	609,914	-14.17
Total Nitrile			
Production	29,457	39,163	-24.78
Imports	4,645	6,441	-27.88
Exports	3,754	4,015	-6.50
Consumption	29,916	40,296	-25.76
Polybutadiene			
Production	177,116	206,034	-14.04
Imports	17,168	18,461	-7.00
Exports	8,308	21,612	-61.56
Consumption	175,376	201,633	-13.02
Ethylene-Propylene			
Production	77,755	107,153	-27.44
Imports	109	126	-13.49
Exports	17,725	21,154	-16.21
Consumption	68,457	81,321	-15.82
Butyl, Polyisoprene, Silicone and other Synthetic Elastomers			
Production	144,794	163,489	-11.44
Imports	21,131	25,314	-16.52
Exports	70,825	80,732	-12.27
Consumption	99,598	134,857	-26.15
Butyl			
Imports	16,088	13,982	15.06
Exports	38,603	41,808	-7.67
Polyisoprene			
Imports	2,938	7,950	-63.04
Exports	3,221	5,174	-37.75
Polychloroprene			
Production	74,234	85,630	-13.31
Imports	855	1,138	-24.74
Exports	30,802	31,053	-.81
Consumption	46,299	56,407	-17.92

Rubber World Stock

Name	Symbol	PRICE							TREND TO MARKET					EARNINGS/SHARE			
									Price Trend (% per day)		Volume Trend (% per day)			Latest 12 Months vs. Preceding 12 Months Change		5 Year Annual Growth Rate	Profit Margin
		High	Low	Close	Change Amt	Change Pct	52 Week High	52 Week Low	Last 30 Days	Last 5 Days	Last 30 Days	Last 5 Days	Last Fiscal Year	Amt	Pct		
		$	$	$	$	%	$	$	%	%	%	%	$	$	%	%	%
Tires and Inner Tubes																	
Aegis Corp	AO	3.00	2.38	2.88	.38	15.00	3.00	2.00	.10	4.20	2.10	12.95	.42	.19 S	67.8	7.0	2.7
Alliance Tire	ATRA	7.88	6.75	6.75	-1.25	-15.63	13.50	6.75	-.69	-.80	3.69	-30.00	.02	-1.53 S	-137.8	-15.0	.7
Armstrong Rub	ARM	23.00	20.00	22.00	.88	4.14	23.00	14.00	-.07	.33	.57	43.60	3.99	6.18 N	NE	-5.0	3.0
Bandag Inc	BDG	34.00	29.88	33.38	3.13	10.33	34.00	20.75	.12	.03	-.90	-88.34	2.76	.11 S	4.1	17.0	10.7
Cooper Tire	CTB	27.38	21.00	26.13	3.13	13.59	27.38	12.25	.10	.22	-.45	-13.73	4.05	-.50 S	-10.8	29.0	4.4
Dunlop Holding	DLP	1.06	.81	.88	-.06	-6.67	1.50	.81	-1.18	-.75	1.74	37.95	-.04	.00 F	NE	-24.0	-.3
Firestone Tire	FIR	14.00	11.50	12.63	.50	4.12	14.00	9.13	.04	.03	2.22	14.84	1.36	-.22 N	-21.7	-25.0	1.8
Gen Tire	GY	28.25	25.00	27.25	2.00	7.92	28.25	17.88	.07	-.30	3.96	3.50	2.63	-.33 N	-10.9	-16.0	3.0
Goodrich B F	GR	26.75	21.25	25.25	2.75	12.22	26.75	16.63	.16	.40	.72	-12.91	3.51	-1.52 S	-46.6	-14.0	1.3
Goodyear Tire	GT	28.38	24.00	27.25	1.00	3.81	28.38	15.88	-.25	-.43	-.90	-18.08	3.36	-.72 S	-19.6	2.0	2.7
Mohawk Rub	MWK	21.63	18.63	19.63	-.38	-1.88	21.63	13.75	.32	-.33	-2.58	-22.35	4.17	.41 S	10.8	60.0	4.0
Uniroyal Inc	R	9.13	7.25	9.00	1.25	16.13	9.13	5.88	.00	.12	4.02	-32.47	1.41	-.26 S	-18.4	56.0	2.0
Rubber Products																	
Amerace Corp	AAE	18.38	16.75	17.88	-.50	-2.72	20.38	14.13	-.47	.90	-2.22	-21.93	3.51	-1.10 S	-28.6	2.0	3.2
Am Biltrite	ABL	6.25	6.00	6.25	.13	2.04	10.38	5.88	-.26	.44	1.16	26.19	-.36	1.42 S	NE	NE	-.7
Carlisle Corp	CSL	26.88	22.25	25.50	1.88	7.94	33.38	18.50	-.09	.57	-4.65	-19.96	3.76	-.16 S	-4.6	33.0	8.7
Dana Corp	DCN	30.50	25.88	29.50	2.25	8.26	30.75	21.88	-.19	1.25	1.36	19.24	3.25	2.28 N	NC	-10.0	4.3
Dayco Corp	DAY	8.50	6.25	8.13	1.13	16.07	13.50	6.25	-.50	6.49	4.26	-9.73	1.13	-.89 N	-88.8	-55.0	1.1
Grt Amer Ind	GRI	13.88	12.63	13.50	.88	6.93	16.63	11.00	-.11	.41	-1.42	-32.95	3.87	-.25 S	-6.6	11.0	4.3
OSullivan Cp	OSL	19.88	17.88	19.50	1.25	6.85	20.00	12.16	-.16	.53	2.05	2.04	1.80	.18 N	10.4	14.0	7.3
Pantasote Inc	PNT	2.75	2.50	2.63	.00	.00	4.25	2.50	-.41	1.61	1.93	-26.25	-.02	-1.08 S	-186.2	-31.0	-.1
Plymth Rub A	PLRA	2.50	2.00	2.50	.13	5.26	3.63	2.00	-.42	4.93	3.23	24.32	.38	-1.07 N	-159.7	80.0	.9
Plymth Rub B	PLRB	2.13	1.88	2.13	.00	.00	3.50	1.75	-.62	2.23	4.77	29.85	NA	NA	NA	NA	NA
Rubbermaid	RBD	50.25	46.00	50.25	3.50	7.49	50.25	34.88	.20	.57	-4.37	4.60	3.31	.48 S	16.4	10.0	7.2

(KEY: NA—Not Applicable NC—Not Calculable NE—Negative Earnings)
Q—First quarter S—Six months N—Nine months F—Fiscal year
**—Other than a quarterly multiple resulting from a fiscal year change*
Table prepared by Media General Financial Services, Richmond, Va. 23261

Quimica Organica De Mexico, one of Mexico's largest producers of thiazole and sulfenamide accelerators, has a surplus capacity of two million pounds per year of these accelerators and intends to market this capacity in the U.S. Qomsa said the recent shutdown of American Cyanamid's capacity in this area led to the decision and that they plan to expand capacity further.

The National Association of Smallholders of Malaysia are planning production cutbacks in natural rubber in response to the low worldwide prices. The association in a statement said it was "deeply concerned that the prices of rubber has remained persistently low, and that the purchases by the Buffer Stock Manager of INRO have only succeeded in maintaining the price around the lower intervention price level." The depressed market has hit the smallholders severely according to the group and they want other measures to reinforce and complement the effort of INRO. Measures adopted to cut back supply include tapping holidays, bans on yield stimulation, stock holdings and accelerated replanting.

News

The 14 merger announcements in the rubber and plastics field in the first half of 1982 is a 250% increase over the four reported in the same period of last year according to W.T. Grimm & Co., a Chicago based merger specialist. Of the seven transactions on which payment information was available, five were for cash, one for stock and one was a combination of cash, stock and/or debt. Divisional or partial sales in the industry accounted for seven of the nine transactions compared with none in the first half of

Summary

P/E	DIVIDENDS			FINANCIAL POSITION					
				(Last Fiscal Year) In $Millions			(Last Fiscal Year) Per Share		
P/E Ratio Today	Indicated Dvd. Rate Amt.	Yield	Last X Dvd. Date	Revenue	Earnings	Current Ratio	Long Term Debt	Stock Equity	Last Bal. Sheet Date
	$	%		$	$		$	$	
6.1	.00	.0	00-00-00	168.4	4.5	2.4	1.81	3.21	1281
NE	.00	.0	06-28-82	69.7	.5	1.2	1.89	8.12	1281
5.8	.80	3.6	08-26-82	560.5	16.6	2.2	22.10	31.88	0981
12.0	.90	2.7	09-14-82	312.5	33.5	4.2	1.02	14.80	1281
6.4	.64	2.4	08-30-82	393.9	17.3	2.3	10.19	19.17	1281
NE	.00	.0	05-26-81	9405.8	-26.5	1.4	.00	1.14	1281
16.0	.60	4.8	09-29-82	4361.0	79.0	1.7	7.21	25.00	1081
10.2	1.50	5.5	07-30-82	2175.2	65.9	1.9	10.53	43.75	1181
14.5	1.56	6.2	08-30-82	3184.6	42.1	1.9	42.17	61.79	1281
9.2	1.40	5.1	08-10-82	9152.9	243.9	2.1	16.06	32.96	1281
4.7	.90	4.6	08-30-82	211.0	8.5	2.4	7.08	24.07	1281
7.8	.00	.0	08-22-78	2260.1	45.3	2.3	17.78	17.14	1281
6.5	1.32	7.4	09-24-82	320.0	10.2	3.1	19.01	44.76	1281
NE	.30	4.8	09-20-82	137.1	-1.0	1.8	2.93	15.44	1281
7.7	.92	3.6	08-16-82	406.3	35.3	2.8	4.36	14.28	1281
12.9	1.60	5.4	08-23-82	2711.1	115.6	2.3	10.95	28.22	1281
12.5	.16	2.0	10-01-82	787.0	9.0	2.1	28.67	23.63	1081
3.9	.00	.0	00-00-00	144.3	6.2	2.0	8.10	22.60	1281
10.2	.56	2.9	09-09-82	73.7	5.4	3.8	.00	10.52	1281
NE	.05	1.9	11-02-81	149.8	-.1	1.8	3.70	8.22	1281
NE	.00	.0	00-00-00	69.6	.6	1.5	.00	7.43	1181
NA	.00	.0	00-00-00	NA	NA	NA	NA	NA	NA
14.8	1.24	2.5	08-09-82	357.1	25.6	2.0	2.05	20.07	1281

...ormation in this table is based on sources believed to be reliable, but its accuracy is not ...nteed. Every effort will be made to correct errors, when discovered in future editions.

1981.

Exposure to certain forms of silica have been linked with silicosis, a fibrotic lung disease which impedes breathing. All silicas are not harmful. For this reason, a standard to differentiate between the least harmful and most harmful is being developed by representatives in the field through ASTM.

More than 150 members of the House and Senate have asked the Reagan Administration to press for a "free and open world market" in footwear to eliminate the rigid protectionism of foreign countries which is funneling an unprecedented surge of shoe imports into the U.S. The Footwear Import Action Committee, a coalition of leaders in labor and industry along with congressional members, pointed out that some 22,000 American jobs have been lost since the President permitted the import relief program on nonrubber footwear to expire in June, 1981. Since then import penetration has soared from under 50% to over 60%. Employment in the industry was 240,000 in 1968 and now stands at 120,000. More than 400 plants have closed in that time. In 1981, imports contributed $2.4 billion to the U.S. trade deficit.

RMA monthly tire shipments & production report
July 1982
(Figures in Thousands of Units)

Passenger Tires	YTD 1982	YTD 1981*	% Change
Shipments			
Original Equipment	20,687	23,242	−10.99
Radial	17,323	19,330	−10.38
Replacement	75,181	72,897	+3.11
Radial	48,013	42,836	+12.09
Export	1,891	2,566	−34.10
Radial	889	1,572	−43.45
Total	97,539	98,705	−1.18
Radial	66,225	63,738	+3.90
Production	87,913	89,082	−1.31
Radial	59,175	56,552	+4.64
Ending Inventory	32,908	31,998	+2.84
Radial	24,007	21,468	+11.83
Truck & Bus Tires			
Shipments			
Original Equipment	3,018	3,766	−19.86
Radial	1,137	918	+25.22
Replacement	15,771	16,102	−2.06
Radial	4,520	4,105	+10.11
Export	573	1,147	−50.04
Radial	149	137	+8.76
Total	19,362	21,015	−7.87
Radial	5,806	5,160	+12.52
Production	17,286	19,134	−9.66
Radial	4,325	3,455	+25.18
Ending Inventory	7,855	8,000	+1.81
Radial	2,752	2,619	+5.08

Financial statements

Dunlop Holdings reported an operating profit of £29 million for the first half, with sales of £775 million.

Eagle-Picher reported a net income of $2.5 million for the third quarter on sales of $128.4 million.

Exxon reported a net income of $885 million on revenues of $25,058 million for the second quarter.

General Tire reported net earnings of $25,422,000 for the third quarter, with net sales of $509,400,000. Third quarter and nine month sales of the Tire and Related Products segment declined primarily as a result of continued weakness in the economy, including automobile, truck and heavy equipment production and low demand for truck and off-the-road replacement tires. Net sales for the Plastics and Industrial Products segments in the third quarter and nine months were below last year's levels.

Myers Industries reported a $622,496 net income for the third quarter on sales of $17,752,957. Stephen E. Myers, President and Chief Operating Officer, said the declines were attributable to a general decrease in demand for consumer products and tire service equipment.

Rubbermaid reported third quarter earnings of $8.3 million on sales of $107.1 million.

Scientific-Atlanta reported net earnings of $2,299,000 on sales of $80,958,000 for the fourth quarter.

Teledyne reported a new income of $77.7 million for the second quarter on sales of $737.3 million. The company said economic conditions adversely affected sales and earnings of many product lines, particularly specialty metals and industrial engines.

Rubber World
NOVEMBER 1982

25 years of insulated wire and cable

by Dr. R.B. Blodgett,
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Rowayton, CT

Introduction

The insulated wire and cable industry has technological roots going back to the early part of the 19th century. Dates of selected key events, for the 112 year period from 1842 to 1954, are listed in Table 1. From its beginnings in 1842, the industry grew until today insulated wire and cable is found in our homes, factories, mines, autos, trains, ships, planes and space probes. It is truly ubiquitous. All of us depend on insulated wire and cable and some of us even make our livelihood from the industry.

How did the wire and cable industry grow and change in the 25 years from 1955 to 1980? How large is it relative to other industries? What of the future? To answer these questions, this article summarizes available data on the physical quantity of cable conductor shipments for five segments of the industry and shows the differences in growth rates for these segments. Explanations for these differences are proposed. Available dollar values for 1955 and 1980 total shipments of insulated wire and cable and for shipments of one segment — power cable — and a subgroup — paper power cable — are related to the physical quantities of cable conductors. Explanations for the changes in dollars per unit weight of conductor are proposed. Available data for the 14 years 1966 to 1980 on the use of polymeric coverings — both insulations and jackets — are presented and explanations proposed for the declines of some and increases of others. The size of the industry is then compared to other activities.

Table 1 — Dates of early technological events in insulated wire and cable industry

Finally, a few general predictions for the next 25 years are made.

... total industry shipments grew from 1955 to 1980 until they were 2.25 times as large as in 1955; however, the Magnet Wire and Power Wire & Cable segments didn't grow as much as the others.

Sources of statistical data

The U.S. Department of Commerce's Bureau of the Census has published since 1963 annual Current Industrial Reports, one series of which covers Insulated Wire and Cable. These reports include the value of shipments, in current dollars, according to industry segment and the weight of metal conductor in each segment. Further details are provided every five years in the Census of Manufacturers: Industry 3357, Non-ferrous Wire Drawing and Insulating. The latest report is dated 1977. Before 1963, Annual Surveys of Manufacturers provided shipment weights and some dollar values based on a sampling plan. These census data have been analyzed and summarized by the

Table 1 — Continued from preceding page

1933	Polyethylene synthesized; replaced gutta-percha in submarine telephone/telegraph cables[f].
1937	Copolymerization of isobutylene with a small amount of butadiene produced a rubber (butyl) more tractable than the polyisobutylene produced earlier in Germany[e]. SBR developed by copolymerization of styrene and butadiene.
World War II	Polyethylene in great demand for radar installations[f]. Butyl crosslinking systems produce low permeability rubber suitable for inner tubes in tires[e] and for medium voltage cables[g]. Polytetrafluoroethylene (Teflon®) synthesized and used in proximity fuses.
mid-forties	Silicone rubber developed[g]. PVC used to insulate cables up to 25 kV in Europe.
1950-54	Chlorosulfonated polyethylene (CSPE) becomes available and is formulated into rubber compounds for use as jackets and 5 kV insulation[g]. Ziegler and co-workers and Natta discover that ethylene can be polymerized to high molecular weight at atmospheric pressure when dissolved in a hydrocarbon and passed over a coordination catalyst[g].

[a] *J.N. Kane "Famous First Facts," 3rd Edition, H.M. Wilson Company, New York, 1964.*

[b] *P.V. Hunter and J. Temple Hazell "Development of Power Cables," Georges Newnes, Limited, London, 1956.*

[c] *ICEA S-19-81/NEMA WC 3 Standard for Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy," NEMA, Washington, DC 20037.*

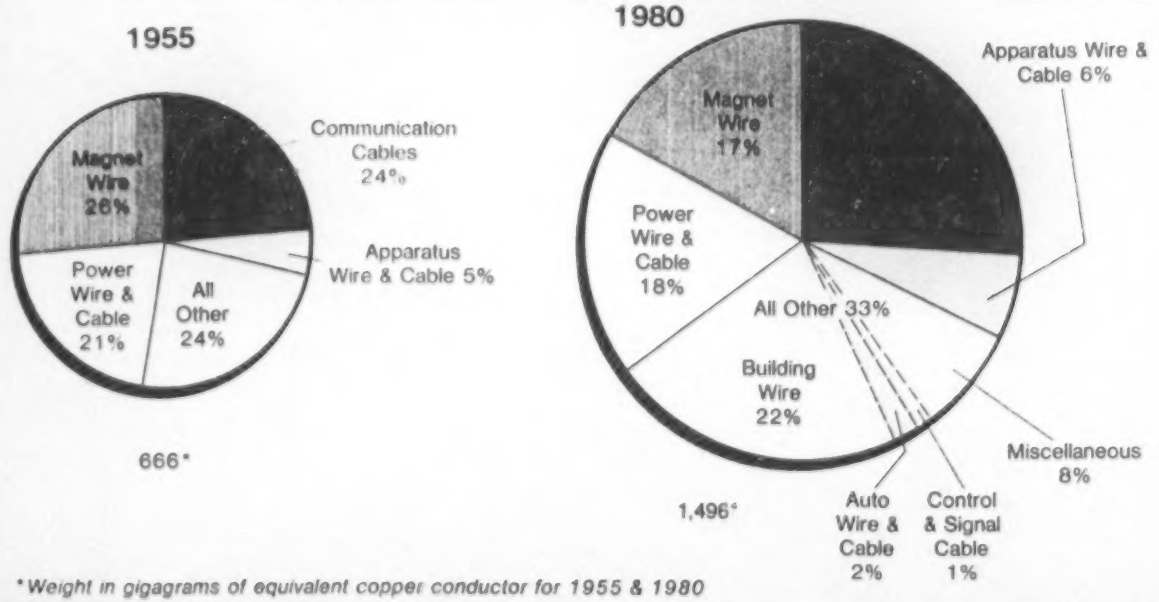
[d] *"Vinyl Compounds" in Encyclopedia of Chemical Technology, Vol. 14, Interscience Encyclopedia Company, New York, 1955.*

[e] *W.J.S. Naunton in "History of the Rubber Industry," P. Schidrowitz and T.T. Dawson, Ed., W. Heffner & Sons, New York, 1952, ch. 8, 102-2.*

[f] *"The 40 Year History of an 'Obscure Cable Covering,' " Kabelnews, Union Carbide Corporation (January 1976).*

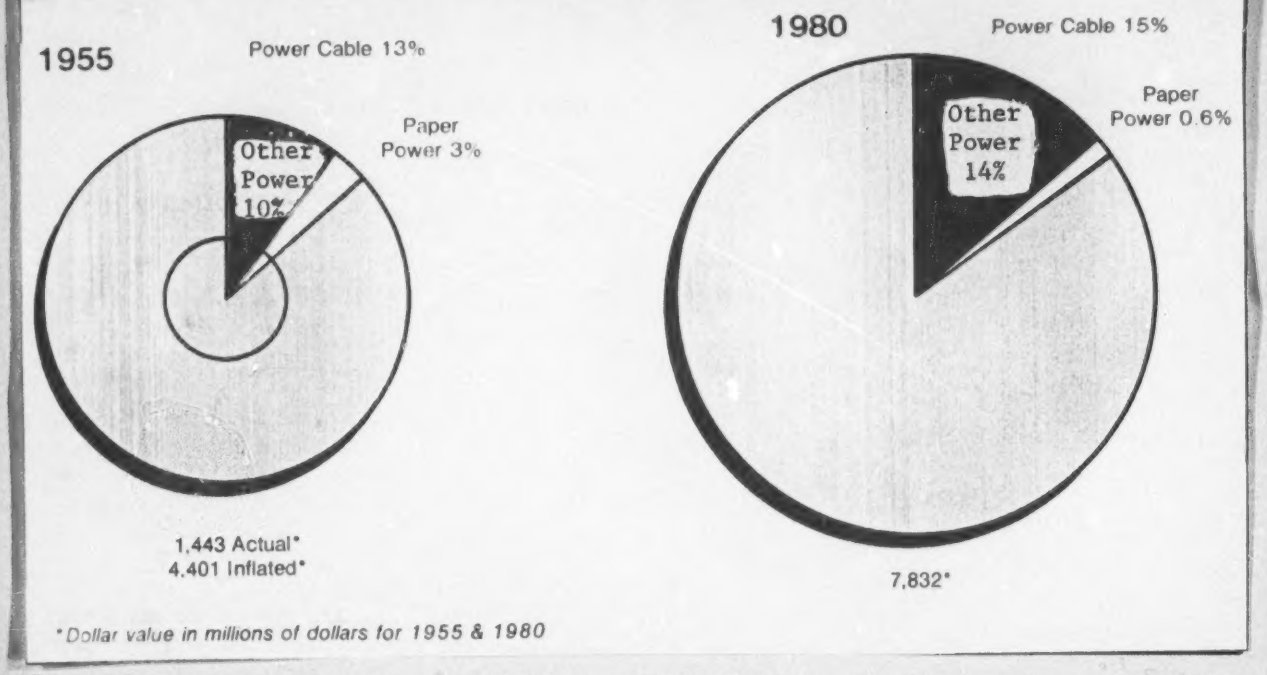
[g] *W.S. Smith, presented at a meeting of the Rubber Division, American Chemical Society, Boston, Massachusetts, October 12, 1978:* Wire Technol *41 (1/2:1979).*

Figure 1 — Shipments of insulated wire and cable (equivalent copper conductor weight)



*Weight in gigagrams of equivalent copper conductor for 1955 & 1980

Figure 2 — Shipments of insulated wire and cables



*Dollar value in millions of dollars for 1955 & 1980

Copper Development Association (New York, NY 10174) as tables of shipments, by segment, in millions of pounds of conductor metal. The Aluminum Association (Washington, DC), from data provided by its members, tabulates shipments of aluminum conductor cables, both bare and insulated. The National Electrical Manufacturers Association (NEMA, Washington, DC 20037) provides shipment data on various products, but only to manufacturers of that product. Additional information was obtained from material suppliers. Finally, my experience in the Insulated Wire and Cable Industry, which began in December 1954, is reflected in the following discussion.

Results and discussion

Growth and changes (1955 to 1980)

Physical quantity — Available census information and sampling estimates of shipments for five segments of insulated wire and cable, for 1955, 1967, and 1980, are summarized in Table 2 along with the ratios of the 1980 and 1955 values. Figure 1 presents the data graphically.

Table 2 and Figure 1 show that total industry shipments grew from 1955 to 1980 until they were 2.25 times as large as in 1955. However, the Magnet Wire and Power Wire and Cable segments didn't grow as much as the others. The main factor for this difference is believed to be a change to higher voltages for magnet and power segments. This reduced the conductor size for a given energy carrying capability. For the Magnet Wire segment there was an abrupt switch from 6 volt to 12 volt batteries. For the Power Wire and Cable segment, the trend toward higher voltages shown in Table 1 continued both in transmission and distribution. For the other segments, with the exception of Auto Wire and Cable for which 1955 data are not available, there was no such trend.

A secondary factor is believed to be the dramatic increase in cost of power in the mid-70s. Growth in power generation and transmission slowed as it continues to do even now. Fewer extra high voltage cables were needed, while control cables became more popular as a means to make the use of power more efficient.

Another factor which would have acted in the other direction was the political emphasis on undergrounding transmission and distribution cables. However, the copper equivalent weight of bare wire and cable shipments in 1980 was 2.06 times the weight of shipments in 1955; growth was thus greater than the 1.9 rate recorded for Insulated Power Wire and Cable.

Value — Table 3 shows that the dollar value of total shipments, adjusted for inflation, increased only 78% in contrast to the 125% increase in physical quantity. Power Wire and Cable showed a 108% increase, with a 90% increase in quantity. The value in dollars per unit weight thus increased. The total value of paper-oil power cable decreased more rapidly than the weight of shipments and dollars per unit weight decreased. Figures 2 and 3 show the effects graphically. The 1955 values in Table 3 are given both in 1955 dollars and in 1980 dollars, the extent of currency debasement from 1955 to 1980 being taken as 3.05, the ratio of the 1980 and 1955 producer price indices: 268.8 for 1980 and 87.9 for 1955.

The available price deflators for the total Wire and Cable Industry (3357) and for Power Cable (33578) were not used, because prices of a given commodity are affected by other factors in addition to currency debasement (inflation). For the record, however, the price deflators are 49 (total) and 62 (power cable).

Why should the value per kilogram of equivalent copper conductor decrease? The main influences are believed to be the following:

1. The industry learned how and where to replace copper with less expensive aluminum conductors. The amount of insulated aluminum conductor increased ten-fold to 171 million kilograms in 1980.

2. The supply/demand equation

Table 2 — Shipments by weight of copper and aluminum conductors and the 1980/1955 Ratios of Equivalent Copper Conductors[a] for various segments of the insulated wire and cable industry (in gigagrams or millions of kilograms)

Industry Segment	1955 Cu	1955 Al	1967 Cu	1967 Al[b]	1980 Cu	1980 Al[c]	Ratio 1980/1955
Communication Cable	159	1	261	2	386	w	2.4
Magnet Wire	170		221	4	209	25	1.5
Power Wire & Cable	140		122	22	125	68	1.9
Apparatus Wire & Cords	35		64	x	93	x'	2.7
Building Wire	)	207		271	27)		
Auto Wire & Cable	)	)			29	y)	2.9
Control & Signal Cable	) 126	17)	59	59	20	z)	
Miscellaneous	)	)			21	36)	
Total	630	18	934	78	1154	171	
Total Equivalent Copper[a]	666		1090		1496		2.25

[a]Equivalent copper conductor is calculated as the sum of actual copper conductor weight plus double actual aluminum weight.
[b]*The amount of aluminum, x, used for apparatus wire and cords in 1967 is unknown.*
[c]*The sum of w,x',y and z is known to be 15 gigagrams and is included in the 171 total, but the amount for each segment has not been disclosed.*

Table 3 — Shipments of insulated wire and cable by value

Shipments of	Millions of Dollars 1955[a]	Millions of Dollars 1955[b]	Millions of Dollars 1980[c]	Dollars per Kilogram Equiv. Copper Conductor 1955[b]	Dollars per Kilogram Equiv. Copper Conductor 1980[c]
All segments	1443	4401	7832	6.61	5.24
Power Wire & Cable	188	573	1193	4.09	4.57
Paper Power Cable	40	122	46	8.25[d]	6.50[e]

[a]Actual dollars in 1955
[b]1955 dollars inflated by 3.05; see text
[c]Actual 1980 dollars
[d]15 gigagrams conductor
[e]7 gigagrams conductor

for copper was such that its price, in 1980 dollars per kilogram, decreased from $0.61 to $0.45 on the London Metal Exchange, and from $0.52 to $0.44 on COMEX. The actual prices in 1955 were $0.19897 and $0.17142 per kilogram.

3. Competition intensified as more companies (e.g., the aluminum producers) entered the market and existing companies added new plants or expanded or renovated existing ones. Capital expenditures of the industry jumped to $190 million in 1965 and 1966 from $46 million in 1963 and 1964; for the five years ending 1977 they averaged $148 million.

4. Technological innovations reduced the cost of cable. Consider the following:

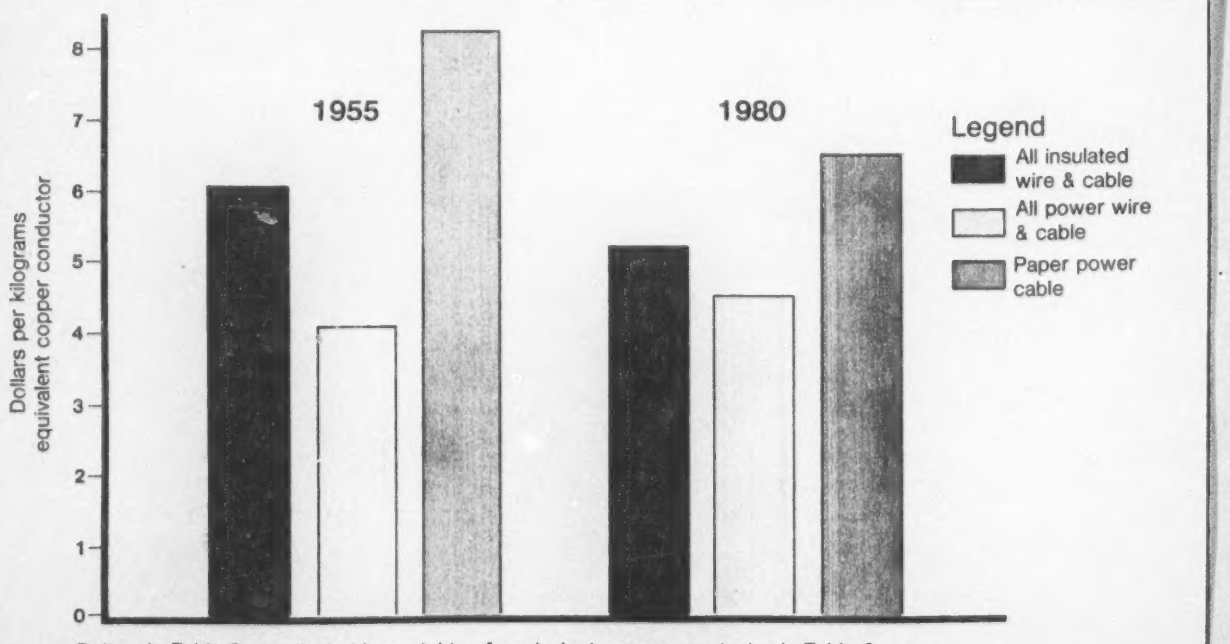
a) Lead sheaths on communication cables were replaced by aluminum or steel coverings.

b) The speed of production machinery such as extruders was increased.

c) A jacketless cable for underground distribution was developed. The polyethylene insulation was covered by a conducting polymeric layer over which were placed spaced neutral wires. Prefabricated terminations and splices were developed for this high-volume URD cable design. Extruded conducting layers replaced conducting tapes.

d) The technique of crosslinking

Figure 3 — The value per unit weight of insulated wire and cable shipments



Dollars in Table 3 are divided by weights of equivalent copper conductor in Table 2

saturated polymers, like polyethylene, with a peroxide was commercialized.

Note that value per unit weight *increased* for the power cable segment. This may reflect a product mix with more high voltage cable than in 1955.

Usage of coverings — Figure 4 reveals trends in the usage of various polymeric coverings during the fourteen years from 1966 to 1980. The coverings include both insulations (see lower line) and jackets (see upper line). The data were compiled from three sources as shown by the three sets of units. The changes with time are valid for all coverings, but the magnitude of one covering cannot be directly compared to that of another covering with a different unit. Explanations for the several changes follow:

1. The decline in paper-oil insulation is a reflection of two factors: The decrease in extra high voltage transmission and competition from PE, XLPE and EP rubber insulations. Paper-oil cables of the pressurized oil type are the preeminent design for EHV transmission and the decline in demand was not anticipated by utility engineers who sponsored field trials of 345 kV cable at Cornell[1] and 550 kV cables at Waltz Mill[2]. A preliminary qualification of 765 kV cable[3], a pipe-cable with a low-loss paper/polypropylene laminate[4] and thin-walled XLPE insulated cables[5] have also been sponsored. About 300 km of 345 kV pipe-type cable have been installed. The competition from extruded dielectric cables began early in the 60s and intensified thereafter as shown by the jump in usage of PE, XLPE and EP rubbers (see the 1973-5 and 1978-80 bars in Figure 3). Several paper cable plants have been closed as a result.

2. The jump in usage of PE insulated URD cables in 1973-5 was reversed five years later when it became clear that the problem of "water trees" in PE in wet environments in the field would not go away. The continued increase in usage of XLPE insulated URD cables reflects its better resistance to formation of trees and its higher temperature rating. A yet unresolved question is whether its tree resistance is adequate.

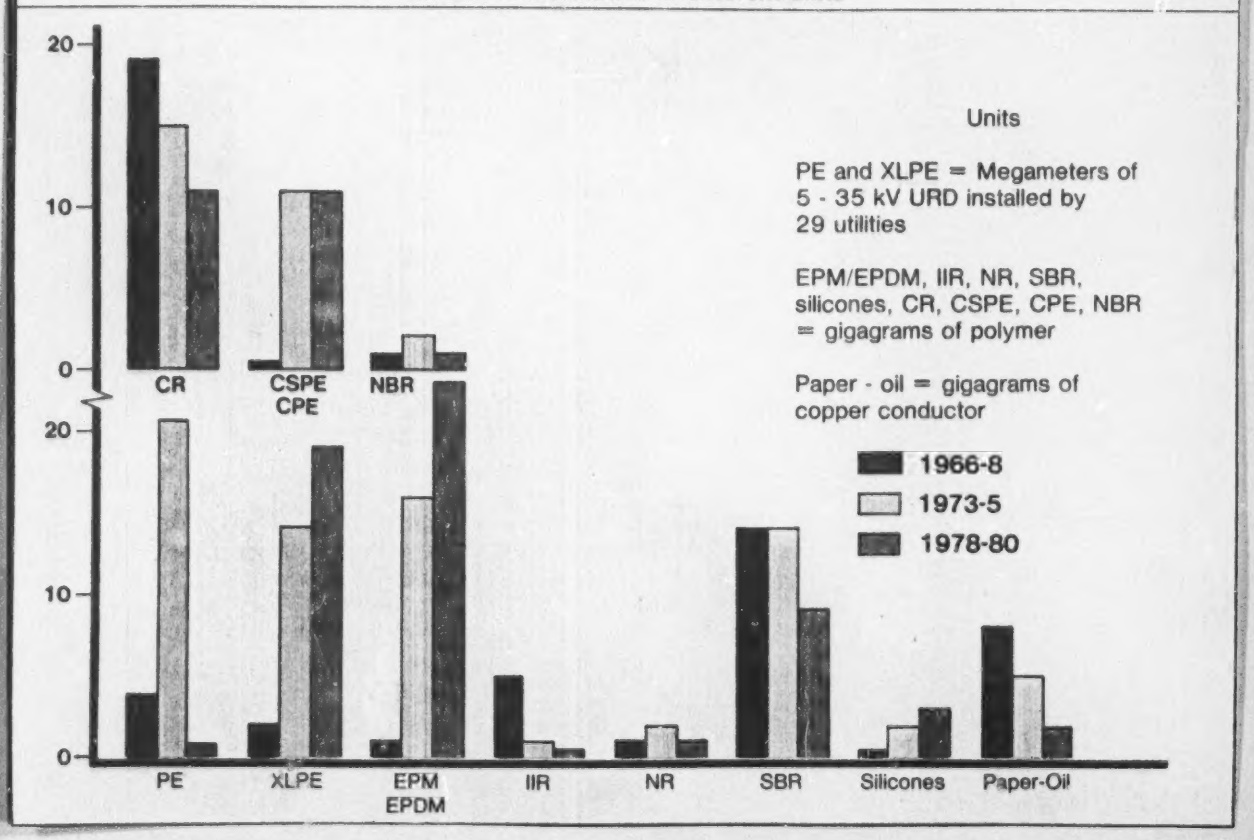
3. The decline in usage of butyl rubber (IIR), natural rubber (NR) and SBR rubber is due primarily to competition from saturated hydrocarbons, PE and EP, crosslinked with a peroxide. These saturated insulations are more heat (oxygen) resistant, more stable electrically in wet locations, and not sensitive to ozone.[6] Natural rubber, at one time (see Table 1) the only crosslinked insulation, is still used for special applications where its sensitivity to ozone and oxygen is not important.

4. Silicone's rapid growth is primarily in the field of household appliances and reflects concern about asbestos and the past growth in new households.

5. Chloroprene rubber (CR, neoprene), as shown in Table 1, was first produced in 1932 and its usage had grown in 35 years by a factor of 80. However, two newer, more heat-resistant polymers, chlorosulfonated polyethylene[7] (CSPE) and chlorinated polyethylene, are competing for the CR markets. The total usage of these chlorinated hydrocarbons peaked in 1973-5 with only a 15% growth from 1966-8 to 1978-80.

6. Nitrile-butadiene rubber (NBR) has a special niche where its oil resistance is important, but this niche is not growing.

Figure 4 — Change in usage of insulations and jackets from 1966-8 to 1978-80, based on information in different units



Relative size

1980 shipments — The $7.8 billion shipments of insulated wire and cable in 1980 was slightly more than the capital expenditures of IBM. Fixing computers was a $6.7 billion business, growing at 20% per year.[8] Union Carbide had sales of $9.3 billion and a growth rate of 10% per year.

1978, 1980 rubber consumption — Worldwide consumption of rubber was 11 teragrams in 1980.[9] Of this quantity, 30% was new natural rubber, the other 70% being synthetic rubber. In 1978, U.S. consumption was 3.2 teragrams of all types of rubber and 12.5 teragrams (14 million tons) of thermoplastics.[10] The total in Figure 4, approximately 0.06 teragrams (53 thousand tons) for 1978-80, is a little less than 2% of total U.S. rubber consumption.

1977 employees, payroll and plants — The last census of manufacturers showed that the industry employed 66,000 people. Its payroll was $876 million, $13,300 per employee, on average. There were 421 plants (establishment), 101 of which employed less than 20 people. Half of the work force was employed in plants with 100-499 employees. The total number of employees represents a 50% growth from 1963. In 1977, Atlantic Richfield employed 51,000 people with a $740 million payroll, $14,500 per employee. Teco Energy, Inc. with 2,500 employees had a payroll equivalent to $15,000 per employee. The Insulated Cable Engineers Association, Inc. has members from 33 companies.

Expectations for the future of power cables

Raw materials — New polymers suitable for the wire and cable industry are not likely to be numerous. The shortages which recently plagued the industry will not be repeated unless the politicians repeat their mistake of legislating price controls and allocations.

Transmission cables — When growth resumes in the generation of electrical power, the first choice for transmission will remain overhead lines, because of their lower cost compared to cable. In metropolitan areas, pipe-cable will continue to be the choice. However, the use of extruded dielectric cables with a metallic sheath is expected to expand.[5]

Distribution cables — Cost and service life are the key factors. Where feasible, distribution will be overhead — bare wire, tree wire or spacer cable. Direct-buried PE insulated URD cable would be the next choice from the standpoint of cost, but its service life is clearly too short in some service environments. Will installation in a conduit or burying an empty conduit next to the cable extend life or provide an economic way for replacement? Will XLPE or EP perform better? Will a more tree-resistant PE have an adequate service life? Large scale installations under way at numerous utilities should answer these questions. The answer, of course, may be that water must be excluded by a metallic covering, but the cost of that cable will be high.

Mining cables — The trend to higher voltages mentioned earlier is definitely extended to mining cables as the equipment for strip-mining grows in size. Long wall mining equipment used in underground mines is also requiring higher voltages. Rubbers will continue to dominate applications where flexibility is important. Adoption of design features developed for utility cables will continue. One example is the use of an extruded insulation shield.

Specialty cables — The trend in cables for the railroads and for ships appears to be toward saturated hydrocarbons made tough by crystallization and flame retardant by additives.

Standards and specifications — Qualification or special type tests have been adopted by IEC, UL, IEEE, AEIC and most recently by ICEA. Further, specification activities are being coordinated to a larger extent and a truly international series of standards is in the future. These standards will gradually emphasize requirements which demonstrate that a cable has characteristics relevant to service performance. However, the "fingerprints" included in all cable standards will not be easily discarded, since true performance requirements are difficult to develop. Concern about fires in nuclear power plants and hotels will produce new requirements for flammability and safety and prompt the development of improved insulations and jacketing materials.[11]

Research — The phenomenon of "water treeing" mentioned earlier has stimulated much research on its causes and control and on the general subject of cable deterioration. An understanding of why some insulations are more resistant to water and electrical stress may result in further increases in service life.

Statistics — Documenting and comparing the service performance of various cable systems is not an easy task according to CIGRE Working Group 21.10, but probably will and should be tackled more often in the future. Weibull statistics will find their greatest application in cable development; CIGRE Working Group 21.09 considers them inappropriate for routine, sample and type tests. Putting statistical sampling of production cable on a sounder basis is another difficult task which is expected to be tackled in the future.

Conclusions

The insulated Wire and Cable Industry is a mature, relatively small industry in transition. It faces numerous technological challenges and opportunities. Like Union Carbide,[12] its assets are being redeployed as each company tries to meet competition and technological challenges, relating to cost, performance, specifications and new products. In some cases, plants have been closed and companies have left the business, but this increases the opportunities for those remaining.

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Slow growth seen for hose & belting

by Joseph Kuebler, Business Editor

When U.S. Industrial rubber products manufacturers took a studied look at what lies ahead for their industry, they concluded there was nothing to get excited about but neither was the outlook exactly depressing.

After digesting all the economic data, those assigned to the forecasting job reported they foresaw a period of "slow growth" between now and 1987. The estimated annual increases in demand for their products ranged from 3% for some years up to 5%.

The study covered three product categories, hose, flat-belting and V-belts and was the cooperative effort of more than 80 companies that comprise the Industrial Products Division of the Rubber Manufacturers Association. The forecast itself was compiled by the Industrial Products Statistical Committee.

"While the words, 'slow growth' portray a rather pessimistic picture, there was a strong feeling in the committee that each of the three categories could face a year in which growth could be substantial if inflation, federal deficits and interest rates are addressed in a positive manner," said Dominic Olivieri, manager of RMA's Management Information Services.

"The committee also felt that such an optimistic outlook could not be justified by economic conditions at the time they met (late summer) to prepare the forecast."

He believes that perhaps the recent decline in interest rates and the upswing on Wall St. could be the very harbingers the committee sensed were needed before they could come up with a more optimistic outlook.

Olivieri presented the forecast at the RMA division's 25th annual meeting in Tarpon Springs, FL.

The forecast portrays future U.S. consumption demands and not U.S. production or shipments.

In developing the analysis of the growth potential for each of the three product categories, the group considered the activity of the various industries that have an effect on industrial products. These include automotive, construction, petroleum, housing, agriculture and mining industries, plus imports/exports.

Here is a summary of the forecast for each category:

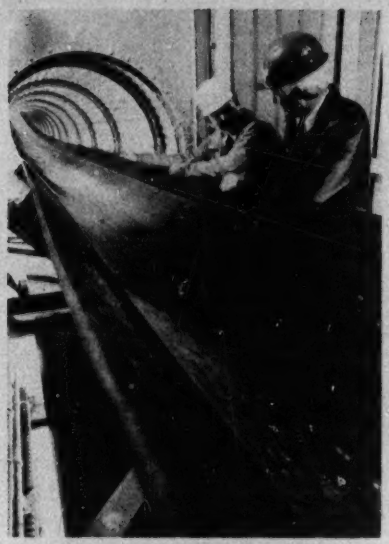
HOSE

The concensus forecast for 1982 shows U.S. consumption of hose (garden hose excluded) at about $845 million with the market growing to $870 million in 1983, $915 million in 1984 and $1,025 billion in 1987.

"The forecast can best be summed up as one that sees a long period of slow growth for the hose industry, with activity for the second half of 1982 showing indications of falling behind that recorded in the first half," Olivieri pointed out.

Adverse economic conditions viewed as putting a damper on the outlook were a weak economy in Canada, our biggest trading partner; one-half of the nearly 4,600 oil rigs operating in the U.S. in 1981, sitting idle in late 1982; weak oil exploration; oil production has fallen to about 16 million barrels a day vs. 36 million barrels in 1980; agriculture facing its fourth consecutive bad year, and the construction and automotive industries both experiencing hard times.

METAL REELS of hydraulic hose braided with wire reinforcement are stored at Goodyear's Norfolk, NE, hose plant before being covered with a tough synthetic rubber and packaged for shipment. The market for hose is expected to reach $1 billion in 1987.



THIS BELT is part of more than a three-mile system of belting used to transport grain to ships for export. The RMA sees slight growth for flat belting.

1981 rubber hose & belting import/export trade (Figures in millions of 1981 dollars)

	Imports	Exports	Balance of Trade
Hose	65	158	+93
Flat Belting	34	17	−17
V-Belts	14	41	+27
Total	113	216	+103

FLAT BELTING

The outlook for flat belting usage ranges from $335 million in 1982, to $345 million in 1983, $360 million in 1984 and $390 million in '87.

Olivieri said this represents an overall growth rate of about 3.1%. Factors having negative effects upon the growth of flat belting include:

Federal budget reductions that have cut into road building and repair programs; cessation of the shale oil program in the West and in Canada, both areas where flat belt utilization held great potential; farmers in a poor position to make capital investments in new equipment; paper and wood industries continuing to report layoffs and plant slowdowns, and the sorry state of the steel industry where employment is at the level it was in the 1933 depression.

The committee did see some positive points such as the potential posed by the new fossil fuel plants due to come on line in 1984, and the utilization of belting to move coal slurries.

V-BELTS

Consumption of V-belts is expected to rise from $400 million this year to $425 million in 1983, $435 million in 1984 and up to $475 million by 1987. The average annual growth rate for the five-year period was 3.5% with the biggest gain of about 4.8% occurring in 1984.

V-belts was seen as a mature industry in which areas of possible new development are presently restricted. Even with the V-belt market tied strongly to the ups and downs of the automotive industry, the committee felt that rapid growth for the auto industry would not necessarily mean rapid growth in the V-belt area.

In the field of imports, Olivieri noted that in the last eight years, hose imports have risen from 2.8 to 6.8% of the total U.S. market with a high of 7.5% attained in 1980.

"While apparent U.S. consumption grew by 95%, imports for the same period grew 380%, a growth pattern substantially faster than the overall market."

In flat belting, imports have risen from 7.0 to 10.2% of the market with a high of 11.8% reached in 1979. The growth for the last eight years was not as dramatic as hose although it did go up 140%.

V-belt imports are considerably lower as a percentage of consumption than either hose or flat belting, increasing from 2.1% in 1973 to 3.5%, in 1981.

The RMA division at its annual banquet honored two industry veterans for "distinguished service to the rubber industry." The honorees were Lawrence H. Pomeroy, president of the Engineered Products Group of BFGoodrich and executive vice president of the company, and Harry F. Schweitzer, who retired recently as general manager of Goodyear's industrial products division.

Hose (Millions of 1982 Dollars)

	Domestic Consumption	% Increase From Previous Year
1982	845	—
1983	870	3.0%
1984	915	5.2%
1985	955	4.4%
1986	990	3.7%
1987	1,025	3.5%

Annual Rate of Growth 1982 to 1987 = 3.9%

Flat belting (Millions of 1982 Dollars)

	Domestic Consumption	% Increase From Previous Year
1982	335	—
1983	345	3.0%
1984	360	4.3%
1985	370	2.8%
1986	380	2.7%
1987	390	2.6%

Annual Rate of Growth 1982 to 1987 = 3.1%

V-belts (Millions of 1982 Dollars)

	Domestic Consumption	% Increase From Previous Year
1982	400	—
1983	415	3.8%
1984	435	4.8%
1985	450	3.4%
1986	465	3.3%
1987	475	2.2%

Annual Rate of Growth 1982 to 1987 = 3.5%